Teacher's Perspective on Using Augmented Reality in the Classroom to Teach Scientific Concepts

NEVIL PRADEEP DSOUZA[1], BHARGAVI D HEMMIGE[2]

[1, 2] Department of Journalism and Communication, Jain (Deemed- to- be University) Lalbagh Road, Bangalore, Karnataka, India

Abstract- Technology plays an essential part in the conveyance of information from one individual to another. Smartphones and computers enable effective communication by enabling the transmission of messages to a big group or a single individual, as well as the receipt of feedback. The integration of technology into educational setting has become increasingly important. Emerging technologies like Augmented reality (AR) introduce computer generated images to the real time environment, and we could see the use this technology in gaming and in the entertainment sector. Numerous research have been undertaken globally to determine the use of Augmented reality technology from the perspective of learners. To fill the void, this study investigates the utility and ease of use of technology from the viewpoint of scientific educators. This study is based on the Technology Acceptance Model (TAM), the Likert scale, and interviews with instructors to determine their opinions. In the perspective of educators, augmented reality (AR) offers great potential and advantages in the creation of instructional content. The limitation of the study, which will be addressed in the further research.

Indexed Terms- Augmented Reality (AR), Teaching learning, Communication, Usefulness of technology, (TAM), Science Education, Scientific learning.

I. INTRODUCTION

Technology plays an essential part in the conveyance of information from one individual to another. Smartphones and computers enable effective communication by enabling the transmission of messages to a big group or a single individual, as well as the receipt of feedback. Communication might incorporate a commercial or social engagement. Alhadlaq (2016), The Internet enables this technology to spread information internationally, The primary objective of computer networks and the Internet in the education sector is to rapidly exchange and transfer information to a huge number of people over large distances. Chromy & sedivy (2015) Aided communication facilitates the efficient and effective transmission of information.

Computers are utilized by educators to illustrate real-time dynamic processes (Hurwitz, 1999). According to Cope and Ward (2002), teachers with little or no computer literacy, prefer to teach using the conventional chalk and board approach. According to Royer (2002), teachers should get trained to use technology in the classroom.

As a result of Covid19, several transformations happened on a global scale, and its influence spread to all industries, compelling everyone to adopt to a new way of life. The Indian government suspended all physical educational facilities and shifted to virtual schooling. As a result of the digital divide, a significant proportion of students missed classroom lectures. Transitioning from traditional teaching techniques to online teaching proved challenging for teachers, students, and educational institutions.

There advantages and disadvantages of attending an online class were examined (naik etall.2021). Emerging media technologies such as augmented reality have made it feasible to integrate digital content into the real world. Virtual teaching is gaining popularity among educators of all levels. Computers, laptops, and smartphones are used to disseminate content. The incorporation of virtual content into the real environment is made possible by Augmented Reality technology, which facilitates the efficient and interesting acquisition of knowledge.

Anderson et all. (2016) in Sweden applied AR Physics software and discovered that AR application enhances teaching by allowing students to apply their subject knowledge and gain practical experience. Kesim study (2021) looked into the impact of using augmented reality (AR) in chemistry learning. The study indicated that AR is an excellent tool for teaching abstract subjects that lack direct observation and examination in science education. The study was based on students' perceptions of using AR to learn chemistry concepts. The kazim AR application was used in a study by Yilmaz etall. (2015) to present concepts that could not be seen with the naked eye. The AR content was used to teach concepts such as the solar system and space for the experimental group. The research study revealed that the experimental group was more successful in understanding the concept than the control group.

II. EDUCATION

In ancient India, there existed a Gurukula system of education in which anybody who wanted to learn went to the home of a teacher (Guru) and begged to be taught. If the guru accepts him as a disciple, he would live with him and help in his daily activities. Not only did this build the relationship between teacher and student, but it also taught the student how to manage a household.

From language to sacred texts, mathematics to philosophy, the guru taught the learner everything essential. sasikumar GNU.org. 2020-21. If there is no significant difference in academic streams, school-focused education policy will place greater emphasis on extracurricular activities, professional development, reading, and mathematics. According to the new 2020 National Education Policy, vocational education will begin in the sixth grade. Prior to the fifth grade, teaching must be in the mother tongue or regional language.

- In accordance with the New School Education Structure

Anganwadi is a pre-school programme for children in their first three years of life. The emphasis will be on activity-based learning. For the following two years, children will be educated in the first and second grades at school.

Students in grades three through five will be educated in science, mathematics, the arts, and other disciplines through experiments between the ages of 8 and 11 years old Classes 6 through 8 and students aged 11 to 14 will engage in these subject-based classes. Beginning in the sixth grade, students will engage in skill development courses.

From ninth to twelve grade, the second stage will be divided into two portions, one of which will feature a comprehensive study of the topics.

III. THEORETICAL BACKGROUND

A systematic literature review of TAM application research papers published between 2003 and 2018 in several educational areas (Granic & Marangunic) disclosed TAM usage patterns in the educational sector (2019). The Technology Adoption Model (Davis, 1989) is one of the most often employed models of technology acceptance and focuses on two key variables that influence an individual's decision to adopt new technology: perceived utility and perceived usability. This study aims to discover if science professors utilize augmented reality technology in the classroom and will concentrate on the usefulness and usability of the applications for communicating concepts with students.

Albert Bandura (1977) created the term "self-efficacy" in 1977. According to Bandura, a person's ability to perform a task is determined by a personal judgment or a set of beliefs. The TAM model, which predicts the user's reaction to technology, is similar to this idea. The notion focuses on whether or not the application should be used as a result of the outcome judgment. The goal of these two concepts is to have a better understanding of teacher acceptance of augmented reality technology.

Amaah (2021) uses Rogers' Diffusion of Innovations theory. This study adopts a phenomenological qualitative research approach through interviews to examine the real experiences and attitudes of pioneer teachers who have employed VR/AR with PK-12 pupils (Rogers, 2003). In this study, important trends and emergent themes relating to pioneer teacher experiences with VR/AR adoption and integration were identified through an empirical data analysis

process. The study by Czerkawaski and Berti (2020) emphasized on AR-learning design and building teams using SAM (Successive Approximation Model) and the Threshold Concepts Framework, which would be utilised to significantly include AR in the learning process. The data collection strategy used a pre-test and post-test method to measure students' exposure with the AR module. The findings revealed that the majority of students had no prior educational experience with augmented reality (AR), and they struggled to identify appropriate ways to incorporate it into their classes. As a result, participants gained an understanding of the importance of AR and reported that they would most likely use it in the future.

Gargrish et all, (2021) The objective of this review is to look at how teachers are using augmented reality technology, as well as the need for training, classroom integration and accessible resources and skills. Qualitative research was done on teachers with various specialisations in suburban and rural areas and the results suggested that the creation process of augmented reality is feasible and simple to adapt to the classroom environment.

A total of 25 teachers from the fields of information and communication technology (ICT), English, mathematics, physics, chemistry, Hindi, arts, and history lent their assistance to the project. Gurevych and others (2021) The paper evaluates various augmented reality technology applications in the educational process, particularly in terms of mobile online instruction, and describes and supports their practicality in physics class. Augmented reality technologies have been identified to enhance the educational process and provide opportunities to apply knowledge in the humanities and the sciences. This technology streamlines the learning process and encourages pupils to dig deeper into the material. In terms of contributing to scientific and technical growth, visual education is the best thing that can be delivered to current pupils.

Augmented reality technology improves education by motivating students to self-study, increasing audience interest in educational material, developing a desire to use modern interactive technical capabilities and technologies, and replacing textbooks and laboratory equipment with multimedia computer models of distance learning.

Kesim and Ozarslan 2012 This article provides an overview of augmented reality (AR) technology and its educational applications. Augmented Reality could be utilised for learning, entertainment, or edutainment by enhancing the user's perspective and interaction with the real environment. The user may navigate the three-dimensional digitized object and observe it from any angle, much like with an actual object. Users can use the information offered by virtual products to do real-world tasks.

Osuna et all. (2019) This research aimed to investigate the technological, pedagogical, and organisational challenges associated with adopting Augmented Reality into higher education. The study was conducted using a questionnaire that was distributed to 246 subject matter experts. Students have expressed greater satisfaction and positive attitudes toward AR when it is used in the classroom, but there are many barriers to overcome, such as a lack of educator training and improvement, a lack of educational experiences, a lack of conceptual foundation, inadequate educational research, and a lack of institutional support.

Petrov &Atanasova (2020) This paper presents a case study of how this technology was used to educate STEM (science, technology, engineering, and mathematics) curriculum in Sofia Secondary School. The long-term effects of utilising facilities for a STEM education programme. The data from the questionnaires was exported and analysed using Microsoft Excel and its data analysis capabilities. All of the results from each group's tests (both before and after AR use) were combined. Incorporating augmented reality (AR) into the learning unit has a substantial impact on the connected content's learning, according to data on the efficacy of learning in augmented settings and written evaluations. Using augmented reality technology, students may explore, study, and engage with STEM information, which is extremely beneficial for STEM education.

Quinetro et all. (2019). It involves researching subjects such as the advantages of augmented reality, its limits, applications, and challenges, its educational scope, the

targeted audience, and the positive and negative consequences of its usage in learning situations involving students with diverse educational requirements. A total of 50 studies were examined between 2008 and 2018 using three interdisciplinary databases: Scopus, Web of Science, and Springer Link.After analysing the data, it was feasible to demonstrate that the use of augmented reality for inclusive scientific education is an area in which more research is needed. The most common benefits mentioned in the population with impairments were motivation, interaction, and developing interest on the side of the learner. Simultaneously, the sample size was cited as a significant methodological constraint; some research utilised two or three people, while others used Single Subject Designs. The research largely involved students as a study population, but there were few frameworks for tackling diversity in education.

Rizov and Rizova (2015) To establish the advantages of augmented reality in higher education, it is necessary to assess the learning results of students who utilised it as a teaching tool in different courses. According to the conclusions of the survey, learners' attention, understanding, and internalisation of a learning material have greatly increased. According to university researchers, the use of augmented reality helps the learning and teaching processes of students in both pedagogical and technological ways.

Saidin et all. (2015) The advantages of AR over traditional technologies (such as e-learning and course materials) and traditional teaching methods are also considered in this review study (chalk, talk and traditional books). The findings of the study indicated that augmented reality technologies, offer promising educational applications in general. The study also highlights certain limitations, which may be addressed in future research.

IV. METHODOLOGY

In case studies, "fieldwork" is a regular feature. The qualitative researcher examines the subject of interest in real time. The researcher travels to the site to collect data in its natural setting. In order to describe andanalyse a scenario, case studies usually delve into extensive depth. Researchers seek to comprehend the

phenomenon, process, or viewpoints of the people participating in the process, (Merriam, 1998)

Participatory research is a means of acquiring information by doing. (Clay Spinuzzi (2005), which is the methodology taken in this study by selecting one of the state board Pre-University colleges in Mangalore, Karnataka, India. A research scholar worked with a teacher for 15 days to train them and generate educational content using an augmented reality software. The study was conducted using theTAM Model and the Self-Efficacy Theory.

Five-point Likert scale questionnaires were used to collect the data, with responses ranging from strongly disagree to strongly agree. Commonly employed in social science research is the Likert scale (vinney 2019).

The purpose of the research was to determine if educators were aware of augmented reality (AR) technology and to train them on how to use the AR application on their smartphones, as well as to determine the applications of AR in education content development. The knowledge produced during online classes was utilised during the pandemic.

Three phases were involved in determining the teacher's perception.

Phase one: involves introducing augmented reality technologies and educational applications.
Phase two: Teachers receive training on how to use technology.
Phase three: Teachers utilizing an augmented reality application to create content.

V. ANALYSIS

The goal of this case study was to find out how teachers felt about utilizing augmented reality to teach science concepts. In this case study, the experiences of individuals with the application are documented. Using TAM for AR Technology, the data was assessed. Educators participated in a training session that utilised Augmented Reality technology. Each participant was asked to complete a questionnaire using a five-point Likert scale ranging from strongly

disagree to strongly agree and was then interviewed to learn about their opinions toward technology use.

Teachers use the Likert scale to determine how strongly they agree or disagree with assertions. Acceptance of the model was based on questionaries in field studies, according to a meta-analysis by Lett et al. (2003), and three out of 101 papers contained qualitative data such as content analysis.

Six teachers participated in the training programme for this study, all of them had a master's degree and the minimum qualifications required. Three of the professors in the sample had 6 to 10 years of experience, while three other teachers had 11 to 15 years of experience in teaching. Teachers from a reputable state board Pre-University participated in this study as full-time employees.

The study began with general instructions and individual training on how to download and use Augmented Reality programmes for the in the creation of educational content. Teachers were confident in their ability to use AR technology after the training, and everyone felt that incorporating AR technology into the classroom would provide a tremendous chance for successful learning, and AR applications would aid in the creative preparation of teaching resources. Teachers stated that using augmented reality technology allows students to focus and pay attention during lectures.

Two teachers disagreed with the assertion that they should spend more time generating material, while two of them were uncertain, and the rest teachers agreed. Educators who have previously utilised technology agreed that it would enhance the quality of education. The usage of this technology will stimulate students to attend lectures more, all of the participating professors agreed. All teachers felt that it would save them time and that they could easily generate curriculum using AR technology.

VI.   DISCUSSION

The teachers were unfavorable. In my opinion, students pay less attention to the topic when AR technology is used; students may focus only on the animation part, which may lead to distraction. The other three teachers disagree with this statement and respond that if simultaneously models are used to relate to the concept students will refer to those for better understanding. One teacher stated that it is challenging to explain a few concepts in biology without models. Sketching on the chalkboard takes a long time, and that with the AR technology, we could project the model and explain it piece by piece. Other teachers have remarked that AR Technology saves teachers time and gives students additional knowledge about a certain topic. It is difficult to express all pertinent information in a short amount of time, but by using this application or 3D models, we may save time and utilise it to deliver more or additional information.

Overall, Teachers were enthusiastic with the new experience and wear ready to create curriculum using AR applications. According to one of the teachers, students would grasp the principles quickly and remember them. AR technology could be used efficiently in teaching, similar to entertainment learning.

Based on the responses to the Likert scale as well as the discussion, it has been observed that AR technology is suitable for the creation of educational content. . Teachers have remarked that this technology is useful in the classroom and that, with the correct training and access to all models in a single application, it is simple to implement for educational reasons.

CONCLUSION AND LIMITATION

Due to the Covid 19 pandemic, all teachers shifted from classroom to virtual teaching, and many teachers used their smartphone to communicate with students. It was discovered during the discussion that teachers sent videos and voice notes to students to use whenever they have access to the internet or electronic devices. The introduction of Augmented Reality provided them with new perspectives and opportunities for effective education. The extensive use of technology in teaching and learning will benefit divvying pupils. If teachers are trained to use Augmented Reality technology in content development, they can use AR technology in their daily lectures based on subject requirements. According to teachers, augmented reality (AR)

technologies have good potential and advantages for creating educational content.

This was a pilot study focusing on the professors at a single insitution. And, with a small sample size, more research will be undertaken; with a big sample size, professors from various universities will participate in the research.

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